

## Utilization of Lemon Peels Powder and Rosemary Powder in Preparing Chicken Burger

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### **Abstract :**

The objective of this study was to investigate the effect of using lemon and rosemary powders on chemical composition, caloric value, sensory evaluation and physical properties of chicken burger. Chicken meat was substituted with lemon peels and rosemary powders as percentage of 3 and 5% . Results indicated that chicken burger prepared with 5% lemon peels powder and that with 5% rosemary powder recorded the highest values of crude protein, crude fat and ash ( $18.36\pm 0.01$ ,  $18.22\pm 0.01$ ), ( $10.86\pm 0.01$ ,  $10.90\pm 0.02$ ), ( $2.65\pm 0.01$  and  $2.57\pm 0.01$  g/100g), respectively . Using of lemon peels and rosemary powders decreased carbohydrates content significantly as compared with control. Using of lemon peels and rosemary powders effect on total calories value of chicken burger . Chicken burger prepared with 5% lemon peels and rosemary powders recorded higher values of calories compared with control ( $216.26\pm 0.11$  and  $213.54\pm 0.02$  vs  $212.25\pm 0.02$  k.cal/100g ), respectively. Chicken burger prepared with 3% lemon peels powder recorded the highest value of appearance , taste, flavor, texture and acceptance ( $7.46\pm 0.98$ ,  $8.83\pm 0.97$ ,  $7.05\pm 1.16$ ,  $7.55\pm 1.04$  and  $7.33\pm 0.68$  ), respectively, followed by control ( $7.44\pm 1.04$ ,  $7.27\pm 0.66$ ,  $7.00\pm 0.48$ ,  $7.44\pm 0.98$  and  $7.33\pm 0.91$  ), respectively. For physical properties , chicken burger prepared with 5% lemon peels powder and chicken burger with 5% rosemary powder recorded the highest values compared with the other samples ( $102.33\pm 0.57$ ,  $72.66\pm 1.52$ ,  $29.67\pm 1.15$ ,  $23.46\pm 0.03$  and  $1.23\pm 0.15$  ), ( $101.00\pm 1.00$ ,  $69.33\pm 0.57$ ,  $31.67\pm 0.00$ ,  $24.30\pm 0.10$  and  $1.38\pm 0.07$  ), respectively. The results indicated that using lemon peels and rosemary powders affect nutritional value , sensory and physical evaluation of chicken burger.

**Key words :** Lemon peels- rosemary- chicken burger -chemical composition - sensory and physical evaluation.

الاستفادة من مسحوق قشور الليمون ومسحوق الروزمارى في اعداد برجر الدجاج

الملخص العربي

هدفت هذه الدراسة الى معرفة تأثير استخدام مساحيق قشور الليمون والروزمارى على التركيب الكيميائي وقيمة السعرات الحرارية والتقييم الحسي والخصائص الفيزيائية لبرجر الدجاج. تم استبدال لحم الدجاج بمساحيق قشور الليمون والروزمارى بنسبة ٣، ٥%. أشارت النتائج إلى أن برجر الدجاج المحضر باستخدام مسحوق قشور الليمون ٥٪، والذي تم تحضيره باستخدام مسحوق

الروزمارى ٥٪ سجلا أعلى قيم البروتين الخام والدهن الخام والرماد (١٨,٣٦±٠,٠١، ١٨,٢٢±٠,٠١)، (١٠,٨٦±٠,٠١، ١٠,٩٠±٠,٠٢)، (٢,٦٥±٠,٠١ و ٢,٥٧±٠,٠١ جم / ١٠٠ جم) على التوالي. أدى استخدام مساحيق قشور الليمون والروزمارى إلى انخفاض معنوي في محتوى الكربوهيدرات مقارنة بالعينة الضابطة. اثر استخدام مساحيق قشور الليمون والروزمارى على القيمة الإجمالية للسعرات الحرارية لبرجر الدجاج. سجل برجر الدجاج المحضر باستخدام مساحيق قشور الليمون والروزمارى ٥٪ قيم اعلى من السعرات الحرارية مقارنة بالعينة الضابطة (٢١٦,٢٦±٠,١١ و ٢١٣,٥٤±٠,٠٢ كيلو كالوري/١٠٠ جرام)، على التوالي. سجل برجر الدجاج المحضر باستخدام مسحوق قشور الليمون ٣٪ أعلى قيمة في المظهر والطعم والنكهة والملمس والقبول (٧,٤٦±٠,٩٨، ٨,٨٣±٠,٩٧، ٧,٥٥±١,٠٤، ٧,٤٤±١,٠٤، ٧,٣٣±٠,٦٨)، على التوالي، يليه العينة الضابطة (٧,٤٤±١,٠٤، ٧,٢٧±٠,٦٦، ٧,٠٠±٠,٤٨، ٧,٤٤±٠,٩٨ و ٧,٣٣±٠,٩١)، على التوالي، بالنسبة للخصائص الفيزيائية سجل برجر الدجاج المحضر باستخدام مسحوق قشور الليمون ٥٪ وبرجر الدجاج المحضر باستخدام مسحوق الروزمارى ٥٪ أعلى القيم مقارنة بالعينات الأخرى (١٠٢,٣٣±٠,٥٧، ٧٢,٦٦±١,٥٢، ٢٩,٦٧±١,١٥، ٢٣,٤٦±٠,٠٣ و ١,٢٣±٠,١٥)، (١٠١,٠٠±١,٠٠، ١,٠٠±١,٠٠، ٦٩,٣٣±٠,٥٧، ٣١,٦٧±٠,٠٠، ٢٤,٣٠±٠,١٠ و ١,٣٨±٠,٠٧)، على التوالي. أشارت النتائج إلى أن استخدام مساحيق قشور الليمون ومسحوق الروزمارى يؤثر على القيمة الغذائية والتقييم الحسي والفيزيائي لبرجر الدجاج.

**الكلمات المفتاحية:** قشور الليمون - الروزمارى -برجر الدجاج- التركيب الكيميائي- التقييم الحسي والفيزيائي .

## Introduction

Chicken meat is the most popular meat protein source , for lack of cultural or religious prohibitat for poultry consumption (**Van der Sluis, 2001 and Barbut , 2002**). Chicken breast is one of the most popular cuts of chicken , due to its high protein , low fat content , which characterized by less saturated than beef fat besides providing zero grams of carbohydrates , making it the optimum choice for people hoping to lose weight or suffering from some diseases such as cardiovascular diseases (**Soriano, 2010**).Chicken burgers are generally greatest in their color , hardness, springiness and chewiness compared to the other poultry burgers such as duck burger (**Ramadhan et al .,2012**). According to **Mikhail et al., (2014)**, chicken meat is the most preferred meat protein source of ready to eat meat. Comparing to the other types of meat , chicken meat is enriched with important nutrients.

Citrus processing generates a considerable amount of wastes which represent a serious environmental problem. Citrus wastes are promising sources with valuable technological and nutritional properties can be used as functional ingredients when designing healthy foods (functional foods) (**Mari´n, et al., 2002**).

Lemon is an important medicinal plant that belongs to Rutaceae family. Citrus fruits such as orange, lemon, and lime, have been widely cultured

and processed into juice.<sup>3</sup> During the manufacture of citrus juice, very large amounts of byproduct wastes, such as peels are formed every year ( **Manthey and Grohmann, 2001**).

Rosemary (*Rosemarinus officinalis* L.) is a woody, evergreen perennial aromatic herb belonging to the family Labiatae, native to the north and south coasts of the Mediterranean Sea. Its leaves are in the form of waxy, slightly curved needles. It is fairly salt and drought tolerant. The most important constituents of rosemary are carnosal, carnosic acid, caffeic acid and its derivatives such as rosmarinic acid. It improve meat quality ( **McCarthy et al., 2001; Smet et al., 2005 and Govaris et al., 2007**) and egg quality ( **Galobart et al., 2001**) and used for flavoring foods and beverages. Various analytical approaches have been documented to determine the functional ingredients of meat products but no satisfactory information available for chicken burger. Thus, the present study was designed to evaluate effects of lemon and rosemary powders added as different ratios 3,5 % to chicken burger formula as partial replacement on chemical composition , caloric value, sensory characteristics and physical properties of chicken burger .

## **Materials and Methods**

### **Materials:**

Lemon ( *citrus lemon* L.) fruits , chicken breast meat and the other ingredients were purchased from the local market , Kafrelsheikh City, Egypt. Rosemary (*Rosemarinus officinalis* L.) leaves were collected from Sakha Agricultural Research Station, Kafrelsheikh Governorate, Egypt.

### **Methods:**

#### **Preparation of lemon and rosemary powders**

Lemon fruits and rosemary leaves were washed by running tap water, lemon fruits peeled and their edible portions were carefully separated. The obtained fresh citrus peels were cut into small pieces before the drying process. Lemon peels and rosemary leaves were dried in an oven (Ecocell Drying Oven, MMM Med center, Germany) at 60°C, ground with a grinder (Moulinex, France) and then stored in polyethylene bags until use.

#### **Preparation of chicken burger**

Chicken burger was formulated as indicated in Table (A)

The burger formulas were formed using a patty marker (stainless steel model “form”) to obtain round discs. After preparation, the chicken burger samples were grilled in a small quantity of sun flower oil for 3 min on one

side and 2 min for the other side and used for sensory evaluation as described by Mohamed,(2012).

**Table (A). Formula of chicken burger**

Ingredients	Control	Formula (1)	Formula (2)	Formula (3)	Formula (4)
Chicken breast meat	100 g.	100 g.	100 g.	100 g.	100 g.
Shortening	10g.	10g.	10g.	10g.	10g.
Starch	10g.	10g.	10g.	10g.	10g.
Black pepper	5 g.	5 g.	5 g.	5 g.	5 g.
Spices	5 g.	5 g.	5 g.	5 g.	5 g.
Lemon peels powder	----	3 g.	5 g.	-----	-----
Rosemary powder	-----	-----	-----	3g.	5 g.

### **Proximate chemical composition of lemon, rosemary powder and chicken burger**

Lemon, rosemary powder and chicken burger were analyzed for chemical composition. All analyses were carried out in triplicate. Moisture, crude protein, fat, ash and crude fiber contents were determined according to A.O.A.C.(1995). Available carbohydrate content were calculated by difference (Menezes *et al.*, 2004).

### **Caloric value of chicken burger**

Caloric values of lemon, rosemary powder and chicken burger were calculated according to Lawrence, (1965).

Caloric value (K.cal/100 g) = (protein x4 )+ (carbohydrate content x4) + (fat content x 9).

### **Sensory evaluation of chicken burger**

Sensory evaluation of chicken burger was carried out with 20 panelists comprising of food stuff and postgraduate students from Faculty of Specific Education, Kafrelsheikh University. Testing was done in the Nutrition and Food Science Laboratory. Each panelist was served with 5

randomly arranged chicken burger samples on a rectangular plastic tray. The 5 samples consisted of 4 types of substituted chicken burger and control. Water was provided for rinsing between the samples. Panelists were required to evaluate appearance, taste, flavor, texture and acceptance of the chicken burger using a 9- point hedonic scale (Ihekoronye and Ngoddy,1985).

### Physical evaluation of chicken burger

Chicken burger samples were weighed in grams before and after cooking as described by method A.A.C.C. (2000).Cooking loss was calculated by difference. Diameter and thickness of chicken burger were measured to the nearest (mm) according to A.A.C.C.(1983).

### Statistical analysis

The mean and the standard deviation were calculated. The obtained data were subjected to one-way analysis of variance. The mean value of treatments was compared according to Duncan's multiple range tests. The data were analyzed using SPSS (version 28) according to Steel and Torrie (1980).

### Results and Discussion

#### Proximate chemical composition of powdered lemon peels and rosemary

Chemical composition of lemon peels and rosemary powders are shown in Table (1). Lemon peels powder was composed of (42.40 ±0.01, 9.44±0.02, 4.96±0.10, 6.26±0.10 , 15.20±0.20 and 21.74±0.11 g/100g), respectively for moisture, crude protein , crude fat, ash, crude fiber and carbohydrates. Rosemary powder was composed of (9.44±0.11, 5.12±0. 10, 15.33±0.02, 7.40±0.10, 4.50±0.11 and 58.21±0.01 g/100g), respectively for moisture, crude protein , crude fat, ash, crude fiber and carbohydrates. There were significant differences between the two powders in nutrients. Caloric value of rosemary powder was higher than lemon peels powder (391.29±0.10 and 169.36±0.11 k.cal/100 g.). It may be due to variation of protein , fat and carbohydrate content in both powders.

**Table (1): Proximate chemical composition of powdered lemon peels and rosemary as (g/100 g D.B.)**

Chemical composition	Lemon peels powder	Rosemary powder
Moisture	42.40±0.01 a	9.44±0.11 b
Crude protein	9.44±0.02 a	5.12±0. 10 b
Crude fat	4.96±0.10 b	15.33±0.02 a
Ash	6.26±0.10 b	7.40±0.10 a

Crude fiber	15.20±0.20 a	4.50±0.11 b
Carbohydrates	21.74±0.11 b	58.21±0.01a
Energy	169.36±0.11 b	391.29±0.10 a

\*Mean values in the same row which are not followed by the same letter indicate significant differences at  $p < 0.05$ .

### Proximate chemical composition of chicken burger

Table (2) showed the chemical composition of chicken burger. Using lemon peels and rosemary powders affect chemical composition of chicken burger. Control recorded the lowest value of moisture, crude protein, crude fat, ash and fiber ( $55.28 \pm 0.04$ ,  $17.43 \pm 0.01$ ,  $9.45 \pm 0.02$ ,  $2.34 \pm 0.01$  and  $1.13 \pm 0.15$  g/100g), respectively. Chicken burger with 3% lemon peels powder and the other with 3% rosemary powder recorded the highest values of moisture ( $56.23 \pm 0.01$  and  $56.80 \pm 0.10$  g/100g), respectively. There were significant differences among all samples in moisture content. Chicken burger with 5% lemon peels powder and the other with 5% rosemary powder recorded the highest values of crude protein, crude fat and ash ( $18.36 \pm 0.01$ ,  $18.22 \pm 0.01$ ), ( $10.86 \pm 0.01$ ,  $10.90 \pm 0.02$ ), ( $2.65 \pm 0.01$  and  $2.57 \pm 0.01$  g/100g), respectively. Proteins were not fortified in the burgers, hence the differences highlighted between control and treatment conditions may be due to the minimal replacement of meat by alternative low-protein ingredients, such as lemon peels powder and rosemary powder in the prepared samples. Obtained values of protein were in line with the range of protein revealed in conventional chicken burgers and chicken burgers incorporated with vegetable ingredients (Carvalho *et al.*, 2019 and Pires *et al.*, 2017). Overall, control burgers from this study showed to be higher in fats than conventional chicken burgers reported in literature (7.49–9.07%) (Carvalho *et al.*, 2019 and Pires *et al.*, 2017).

Chicken burger with 5% lemon peels powder and the other with 3, 5% rosemary powder recorded the highest values of crude fiber ( $1.33 \pm 0.01$ ,  $1.41 \pm 0.01$  and  $1.61 \pm 0.01$  g/100g), respectively as the dehydrated ingredients present in lemon peels powder and rosemary powder burgers contributed to increase the fiber in the meat product where it would otherwise be basically absent. Using lemon and rosemary powder decreased carbohydrates content significantly compared with control ( $14.37 \pm 0.32$  g/100g), while it recorded ( $11.83 \pm 0.02$ ,  $11.27 \pm 0.02$ ,  $11.33 \pm 0.06$  and  $10.64 \pm 0.11$  g/100g), respectively for chicken burger with 3, 5% lemon powder, 3 and 5% rosemary powder, respectively. Lemon peels and rosemary powder affect significantly on protein, fat, ash content compared with control. The ash content for the crispy chicken burger

patties was also not affected by the different ingredients and formulations probably due to the low mineral content in all the flour used whereby the mineral turned into ashes when burnt (**Bamforth and Ward,2014**). Ash values from this study were nearly in agreement with the ash of conventional chicken burgers and those enriched with alternative ingredients as well (2.05–2.21%) (**Carvalho et al., 2019 and Pires et al.,2017**). There were significant differences between chicken burger with 3 and 5% rosemary powder compared with control for crude fibers, while there were no significant differences between chicken burger with 3 and 5% lemon peels powder. The carbohydrate and ash contents were insignificantly different for all chicken burger formulations (**Siti et al.,2022**). Using lemon peels powder and rosemary powder resulted in significant difference among samples in terms of moisture, crude protein, crude fat, ash and carbohydrates.

**Table (2) : Proximate chemical composition of chicken burger**

Samples	Moisture	Crude protein	Crude fat	Ash	Crude fibers	Carbohydrates
Control	55.28±0.04 e	17.43±0.01 e	9.45±0.02 d	2.34±0.01 e	1.13±0.15 d	14.37±0.32 a
Chicken burger with 3% lemon peels powder	56.23±0.01 b	17.71±0.01 d	10.51±0.0 1b	2.51±0.01 c	1.21±0.01 cd	11.83±0.0 2 b
Chicken burger with 5% lemon peels powder	55.53±0.02 d	18.36±0.01 a	10.86±0.0 1 a	2.65±0.01 a	1.33±0.01 bc	11.27±0.02 cd
Chicken burger with 3% rosemary powder	56.80±0.10 a	17.77±0.02 c	10.23±0.1 5 c	2.46±0.01 d	1.41±0.01 b	11.33±0.06 c
Chicken burger with 5% rosemary powder	56.06±0.02 c	18.22±0.01 b	10.90±0.0 2 a	2.57±0.01 b	1.61±0.01 a	10.64±0.11 d

\*Mean values in the same column which are not followed by the same letter indicate significant differences at  $p < 0.05$ .

### Caloric values of chicken burger

Table (3) showed caloric value of chicken burger . Chicken burger with 5% lemon peels powder and chicken burger with 5% rosemary powder had the highest values of protein calories and fat calories ( $73.44 \pm 0.11$  ,  $72.88 \pm 0.11$ ,  $97.74 \pm 0.10$  and  $98.10 \pm 0.01$  K.cal/100 g), respectively. Control recorded the highest value of carbohydrates calories ( $57.48 \pm 0.11$  k.cal/100g). Using lemon peels and rosemary powder affect total calories value of chicken burger . Chicken burger with 5% lemon peels and rosemary powder recorded the highest value of calories compared with control ( $216.26 \pm 0.11$  and  $213.54 \pm 0.02$  k.cal/100g). , respectively compared with control ( $212.25 \pm 0.02$  k.cal/100g). Chicken burger with 3% rosemary powder recorded the lowest value of total calories ( $208.47 \pm 0.10$  k.cal/100g), it may be due to decreasing in protein calories, fat calories and carbohydrates calories of sample ( $71.08 \pm 0.03$ ,  $92.07 \pm 0.01$  and  $45.32 \pm 0.01$  k.cal/100g), respectively. There were significant differences between samples for calories of protein , fat and total caloric values , indicating that using lemon peels and rosemary powders affect caloric values of chicken burger.

**Table (3): Caloric values of chicken burger (K.cal/100 g)**

Samples	Sources of calories			Total caloric values
	Protein	Fat	Carbohydrates	
Control	$69.72 \pm 0.10$ e	$85.05 \pm 0.11$ e	$57.48 \pm 0.11$ a	$212.25 \pm 0.02$ d
Chicken burger with 3% lemon peels powder	$70.84 \pm 0.20$ d	$94.59 \pm 0.12$ c	$47.32 \pm 0.05$ b	$212.75 \pm 0.15$ c
Chicken burger with 5% lemon peels powder	$73.44 \pm 0.11$ a	$97.74 \pm 0.10$ b	$45.08 \pm 0.02$ cd	$216.26 \pm 0.11$ a
Chicken burger with 3% rosemary powder	$71.08 \pm 0.03$ c	$92.07 \pm 0.01$ d	$45.32 \pm 0.01$ c	$208.47 \pm 0.10$ e
Chicken burger with 5% rosemary powder	$72.88 \pm 0.11$ b	$98.10 \pm 0.01$ a	$42.56 \pm 0.01$ d	$213.54 \pm 0.02$ b

**\*Mean values in the same column which are not followed by the same letter indicate significant differences at  $p < 0.05$ .**

### **Sensory evaluation of chicken burger**

Table (4) showed sensory evaluation of chicken burger. Sensory evaluation values were affected by using lemon peels and rosemary powders. Chicken burger with 3% lemon peels powder recorded the highest value of appearance , taste, flavor, texture and acceptance ( $7.46 \pm 0.98$ ,  $8.83 \pm 0.97$ ,  $7.05 \pm 1.16$ ,  $7.55 \pm 1.04$  and  $7.33 \pm 0.68$  ), respectively, followed by control ( $7.44 \pm 1.04$ ,  $7.27 \pm 0.66$ ,  $7.00 \pm 0.48$ ,  $7.44 \pm 0.98$  and  $7.33 \pm 0.91$ ), respectively. Chicken burger with 3% rosemary powder recorded the lowest value of sensory characteristics as it recorded ( $6.61 \pm 0.97$ ,  $6.55 \pm 1.19$ ,  $6.60 \pm 0.97$ ,  $7.22 \pm 1.11$  and  $6.66 \pm 1.02$ ), respectively. Sensory characteristics were improved with increasing rosemary powder level as it recorded ( $6.88 \pm 0.96$ ,  $6.66 \pm 0.68$ ,  $6.65 \pm 1.19$ ,  $7.33 \pm 1.13$  and  $7.22 \pm 0.64$  ), respectively. For appearance , there were non significant differences among control, chicken burger prepared with 3% , 5 %lemon peels powder and between burger samples with 3, 5 % rosemary powder as well . For taste, there were non significant differences between control, chicken burger prepared with 3% , 5 % lemon peels powder ,also between chicken burger prepared with 3, 5 % rosemary powder. For flavor, there were non significant differences between control, chicken burger prepared with 3% lemon peels powder . Significant differences were found between chicken burger prepared with 3 and 5% lemon peels powder. There were non significant differences between chicken burger prepared with 3 and 5% rosemary powder. For texture , significant differences were found between all samples . Using lemon peels powder and rosemary powder affected texture of chicken burger. For acceptance, there were non significant differences between control and chicken burger prepared with 3% lemon peels powder also between 5% lemon peels powder , 5% rosemary powder. Significant differences were found between 3% and 5% rosemary powder. These results were in agreement with (Mai *et al.*, 2019). Several studies have revealed that the strongest quality attributes for burger patties are flavor, appearance, juiciness, texture and healthiness (Taylor *et al.*,2020). For the appearance attributes, the mean values were insignificantly different between formulations of the same ratio of chicken burger. Based on the sensory evaluation, all chicken burger patties formulations were acceptable to the panelists ( Siti *et al.*,2022).

Table ( 4 ): Sensory evaluation of chicken burger

Sensory Characteristics	Control	Chicken burger with 3% lemon peels powder	Chicken burger with 5% lemon peels powder	Chicken burger with 3% rosemary powder	Chicken burger with 5% rosemary powder
Appearance	7.44±1.04 a	7.46±0.98 a	6.88±0.75 ab	6.61±0.97 b	6.88±0.96 ab
Taste	7.27±0.66 ab	8.83±0.97 a	6.94±0.99 b	6.55±1.19 c	6.66±0.68 c
Flavor	7.00±0.48 a	7.05±1.16 a	6.61±1.03 b	6.60±0.97 b	6.65±1.19 b
Texture	7.44±0.98 b	7.55±1.04 a	7.33±1.02 c	7.22±1.11 d	7.33±1.13 c
Acceptance	7.33±0.91 a	7.33±0.68 a	7.27±0.89 b	6.66±1.02 c	7.22±0.64 b

\*Mean values in the same row which are not followed by the same letter indicate significant differences at  $p < 0.05$ .

### Physical properties of chicken burger

Table (5) showed physical properties of chicken burger . Physical properties included weight before and after cooking, cooking loss, diameter and thickness. Control recorded the lowest value of physical properties (99.66±0.57, 100.33±0.57, 102.33±0.57, 100.00±1.00 and 101.00±1.00), respectively . Using lemon peels and rosemary powder raised all physical properties of chicken burger .

Chicken burger with 5% lemon peels powder and chicken burger prepared with 5% rosemary powder recorded the highest values of physical properties compared with the other samples (102.33±0.57, 72.66±1.52, 29.67±1.15, 23.46±0.03 and 1.23±0.15), (101.00±1.00, 69.33±0.57, 31.67±0.00, 24.30±0.10 and 1.38±0.07), respectively. For appearance there were non significant differences between control , chicken burger prepared with 3 % and 5% lemon peels powder , also , there were non significant differences between, chicken burger prepared with 3% and 5% rosemary powder. For taste, there were non significant differences between

control , chicken burger prepared with 3 % and 5% lemon peels powder , also , there were non significant differences between, chicken burger prepared with 3% and 5% rosemary powder. For weight before cooking , there were non significant differences between control , chicken burger prepared with 3 % and 5% lemon peels powder , also , there were non significant differences between, chicken burger prepared with 3% and 5% rosemary powder . For weight after cooking , there were non significant differences between chicken burger prepared with 3% lemon peels powder and chicken burger prepared with 5% rosemary powder, also , there were non significant differences between control and chicken burger prepared with 3% rosemary powder. Significant differences were found between chicken burger prepared with 3% and 5% lemon peels powder , also between chicken burger prepared with 3% and 5% rosemary powder. Cooking loss is closely related to sensorial properties such as taste, appearance, and juiciness of the meat product (Aaslyng *et al.*, 2003). There were non significant differences between chicken burger with 3% lemon peels powder and chicken burger prepared with 5% rosemary powder. Using lemon peels and rosemary powders affected physical properties of chicken burger. For diameter, using lemon peels and rosemary powder affected significantly on all samples . For thickness, , there were significant differences between chicken burger prepared with 3 and 5% lemon peels powder. Chicken burger with 5% lemon peels powder recorded the highest value of weight before and after cooking , diameter and thickness, while it recorded the lowest value of cooking loss ( $102.33\pm 0.57$ ,  $72.66\pm 1.52$ ,  $24.30\pm 0.10$ ,  $1.38\pm 0.07$  and  $29.67\pm 1.15$  ), respectively.

Table ( 5 ): Physical properties of chicken burger

Physical properties	Weight before Cooking (g)	Weight after Cooking (g)	Cooking loss (g)	Diameter cm	Thickness cm
Chicken burger					
Control	99.66±0.57 b	64.00±1.00 c	35.66±0.57 a	22.80±0.10 e	1.10±0.10 c
Chicken burger with 3% lemon peels powder	100.33±0.57 b	69.00±1.00 b	31.33±0.57 c	23.16±0.15 d	1.20±0.10 b
Chicken burger with 5% lemon peels powder	102.33±0.57 a	72.66±1.52 a	29.67±1.15 d	24.30±0.10 a	1.38±0.07 a
Chicken burger with 3% rosemary powder	100.00±1.00 b	67.00±1.00 c	33.00±0.57 b	24.00±0.10 b	1.30±0.20 ab
Chicken burger with 5% rosemary powder	101.00±1.00 b	69.33±0.57 b	31.67±0.00 c	23.46±0.03 c	1.23±0.15 b

\*Mean values in the same column which are not followed by the same letter indicate significant differences at  $p < 0.05$ .

### Conclusion

It could be concluded that using lemon peels and rosemary powders improved nutritional value , sensory and physical properties of chicken burger. Available results on nutritional and sensory evaluation of chicken burger assist consumers to make a healthier choice for maintaining a healthy lifestyle.

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